

What is claimed is:

1. An optical communication system, comprising:
an optical tunable filter, whose wavelength
5 transmission characteristic varies depending on a
control signal, transmitting and extracting signal light
with a specific wavelength from signal light multiplexed
by a wavelength-division multiplexing (WDM) method;
a detection unit detecting signal light extracted
10 by the optical tunable filter; and
a control signal generating unit generating the
control signal needed to enable the optical tunable filter
to extract signal light with a predetermined wavelength
by the detection unit, based on a detected result obtained
15 by shifting a wavelength transmission characteristic
of the optical tunable filter in a wavelength band
including all segments of the multiplexed signal light.
2. The optical communication system according to
20 claim 1, wherein
said control signal generating unit generates the
control signal needed to extract the signal light with
a desired wavelength, based on both the detected result
and information indicating a current operating situation
25 of the multiplexed signal light.

3. An optical communication system, comprising:

an optical tunable filter, whose wavelength transmission characteristic varies depending on a control signal, transmitting and extracting signal light with a specific wavelength from signal light multiplexed by a wavelength-division multiplexing (WDM) method;

a detection unit detecting signal light extracted by the optical tunable filter;

10 an operation unit operating to generate information for designating the control signal needed to enable the optical tunable filter to extract signal light with a designated wavelength, based on a detected result of two segments of signal light at each edge of the wavelength band obtained by the shifting of the detection unit when shifting a wavelength transmission characteristic of the optical tunable filter from outside a wavelength band including all segments of the multiplexed signal light; and

20 a control signal generating unit generating the control signal according to the designation information.

4. The optical communication system according to claim 3, wherein

25 said operation unit executes the computation,

based on both the detected result and information indicating a current operating situation of the multiplexed signal light.

- 5 5. An optical communication system, comprising:
 an optical tunable filter, whose wavelength
 transmission characteristic varies depending on a
 control signal, transmitting and extracting signal light
 with a specific wavelength from signal light multiplexed
10 by a wavelength-division multiplexing (WDM) method;
 a detection unit detecting signal light extracted
 by the optical tunable filter;
 an optical wavelength detecting unit detecting
 signal light with a specific wavelength of all segments
15 of signal light extracted by the optical tunable filter;
 an operation unit operating to generate
 information for designating the control signal needed
 to enable the optical tunable filter to extract signal
 light with a designated wavelength, based on both a
20 detected result of the detection unit and the optical
 wavelength detecting unit and information indicating
 a current operating situation of the multiplexed signal
 light; and
 a control signal generating unit generating the
25 control signal according to the designation information.

6. An optical communication system, comprising:
- an optical tunable filter, whose wavelength transmission characteristic varies depending on a control signal, transmitting and extracting signal light with a specific wavelength from signal light multiplexed by a wavelength-division multiplexing (WDM) method;
 - a detection unit detecting signal light extracted by the optical tunable filter;
 - 10 a reference signal light detecting unit detecting reference signal light that is known to be always included in signal light inputted to the optical tunable filter of all segments of signal light extracted by the optical tunable filter;
 - 15 an operation unit operating to generate information for designating the control signal needed to enable the optical tunable filter to extract signal light with a predetermined wavelength, based on both a detected result of the detection unit and a detected result of the reference signal light detecting unit;
 - 20 and
 - a control signal generating unit generating the control signal according to the designation information.
- 25 7. The optical communication system according to

claim 5, wherein

said optical wavelength detecting unit performs the detection of signal light with a specific wavelength of the multiplexed signal light.

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8. The optical communication system according to claim 5, wherein

said optical wavelength detecting unit comprises a periodic filter whose free spectrum range (FSR) is the same as a wavelength interval between two segments of adjacent signal light of the multiplexed signal light and whose peak of a wavelength transmission characteristic coincides with a wavelength of the signal light.

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9. The optical communication system according to claim 8, wherein

full width at half maximum (FWHM) and finesse of said periodic filter are between 0.1nm and 0.3nm and between 3 and 8, respectively.

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10. The optical communication system according to claim 8, further comprising

a control unit controlling a change of wavelength transmission characteristic of said optical tunable

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filter in such a way as to increase amount of light of signal light that transmits said periodic filter.

11. An optical communication system, comprising:

- 5 an optical tunable filter, whose wavelength transmission characteristic varies depending on a control signal, transmitting and extracting signal light with a specific wavelength from signal light multiplexed by a wavelength-division multiplexing (WDM) method;
- 10 an optical wavelength detecting unit detecting signal light with a specific wavelength of all segments of signal light extracted by the optical tunable filter;
- an operation unit operating to generate information for designating the control signal needed
- 15 to enable the optical tunable filter to extract signal light with a predetermined wavelength, based on both a detected result of the light detection unit and information indicating a current operating state of the multiplexed signal light; and
- 20 a control signal generating unit generating the control signal according to the designation information.

12. The optical communication system according to claim 5, wherein

- 25 said optical wavelength detecting unit comprises

a periodic filter and

said operation unit operates to generate information for designating the control signal needed to enable the optical tunable filter to extract signal
5 light with a designated wavelength, based on detected results of two segments of signal light at each edge of the wavelength band that is transmitted through the periodic filter and is obtained by shifting when shifting the wavelength transmission characteristic of the
10 optical tunable filter from outside a wavelength band including all segments of the multiplexed signal light.

13. The optical communication system according to claim 3, wherein

15 when receiving no instruction to extract signal light, said operation unit operates to generate in advance the designation information needed to select and extract one arbitrary segment of signal light from the multiplexed signal light, and when receiving the instruction later,
20 said operation unit operates to generate the control signal needed to extract the designated signal light, based on information obtained up to then.

14. The optical communication system according to
25 claim 3, wherein

when the instruction to extract signal light is modified, said operation unit operates to generate the designation information needed to extract modified designated signal light, based on information obtained
5 prior to the reception of the modified instruction.

15. The optical communication system according to claim 3, wherein

when determining the existence/non-existence of
10 signal light, based on a detected result of said detection unit, said operation unit sets a reference of the determination, based on a signal level detected by said detection unit when a wavelength transmission characteristic of said optical tunable filter is set
15 so that signal light with a wavelength located outside a wavelength band including all segments of the multiplexed signal light can be transmitted.

16. The optical communication system according to
20 claim 15, wherein

when determining the existence/non-existence of signal light, based on a detected result of said detection unit, said operation unit determines a target signal not to be signal light if the size of a target signal
25 level is less than the predetermined value.

17. The optical communication system according to claim 16, wherein

said operation unit maintains a maximum signal
5 level of signal light detected by the shift of said
detection unit when shifting the wavelength transmission
characteristic of said optical tunable filter in a range
where the size of a target signal level exceeds the
predetermined value, and if said detection unit detects
10 the decrease of a signal level from the maximum value
by more than a predetermined value when continuing to
shift the wavelength transmission characteristic in a
predetermined range after detecting the maximum value,
said operation unit regards the control signal generated
15 by said control signal generating unit when detecting
the maximum value as an optimal control signal to be
applied to said optical tunable filter to extract the
signal light, and performs the computation.

20 18. The optical communication system according to
claim 5, wherein

when receiving no instruction to extract signal
light, said operation unit operates to generate in advance
the designation information needed to select and extract
25 one arbitrary segment of signal light from the multiplexed

signal light, and when receiving the instruction later, said operation unit operates to generate the control signal needed to extract the designated signal light, based on information obtained up to then.

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19. The optical communication system according to claim 5, wherein

when the instruction to extract signal light is modified, said operation unit operates to generate the designation information needed to extract modified designated signal light, based on information obtained prior to the reception of the modified instruction.

20. The optical communication system according to claim 5, wherein

when determining the existence/non-existence of signal light, based on a detected result of said detection unit, said operation unit sets a reference of the determination, based on a signal level detected by said detection unit when a wavelength transmission characteristic of said optical tunable filter is set so that signal light with a wavelength located outside a wavelength band including all segments of the multiplexed signal light can be transmitted.

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21. The optical communication system according to claim 20, wherein

when determining the existence/non-existence of signal light, based on a detected result of said detection unit, said operation unit determines a target signal not to be signal light if the size of a target signal level is less than the predetermined value.

22. The optical communication system according to claim 21, wherein

said operation unit maintains a maximum signal level of signal light detected by the shift of said detection unit when shifting the wavelength transmission characteristic of said optical tunable filter in a range where the size of a target signal level exceeds the predetermined value, and if said detection unit detects the decrease of a signal level from the maximum value by more than a predetermined value when continuing to shift the wavelength transmission characteristic in a predetermined range after detecting the maximum value, said operation unit regards the control signal generated by said control signal generating unit when detecting the maximum value as an optimal control signal to be applied to said optical tunable filter to extract the signal light and performs the computation.

23. A method for controlling an optical tunable filter, comprising:

detecting signal light extracted by the optical
5 tunable filter, whose wavelength transmission
characteristic varies depending on a control signal,
transmitting and extracting signal light with a specific
wavelength from signal light multiplexed by a
wavelength-division multiplexing (WDM) method; and
10 generating the control signal needed to enable the
optical tunable filter to extract signal light with a
predetermined wavelength, based on the detected result
obtained by shifting the wavelength transmission
characteristic of the optical tunable filter in a
15 wavelength band including all segments of the multiplexed
signal light.

24. A method for controlling an optical tunable filter, comprising:

20 detecting signal light extracted by the optical
tunable filter, whose wavelength transmission
characteristic varies depending on a control signal,
transmitting and extracting signal light with a specific
wavelength from signal light multiplexed by a
25 wavelength-division multiplexing (WDM) method;

generating information for designating the control signal needed to enable the optical tunable filter to extract signal light with a designated wavelength, based on a detected result of two segments of signal light at each edge of the wavelength band obtained by the detecting result when shifting a wavelength transmission characteristic of the optical tunable filter from outside a wavelength band including all segments of the multiplexed signal light; and
10 generating the control signal according to the designation information.

25. A method for controlling an optical tunable filter, comprising:

15 performing the first detection of detecting signal light extracted by the optical tunable filter, whose wavelength transmission characteristic varies depending on a control signal, transmitting and extracting signal light with a specific wavelength from signal light multiplexed by a wavelength-division multiplexing (WDM) method;
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performing the second detection of detecting signal light with a specific wavelength of all segments of signal light extracted by the optical tunable filter;
25 generating information for designating the

control signal needed to enable the optical tunable filter
to extract signal light with a designated wavelength,
based on both the detected results of the first and second
detection and information indicating a current operating
5 situation of the multiplexed signal light; and
generating the control signal according to the
designation information.

26. A method for controlling an optical tunable filter,
10 comprising:

detecting signal light extracted by the optical
tunable filter, whose wavelength transmission
characteristic varies depending on a control signal,
transmitting and extracting signal light with a specific
15 wavelength from signal light multiplexed by a
wavelength-division multiplexing (WDM) method;

detecting reference signal light that is known to
be always included in signal light inputted to the optical
tunable filter of all segments of signal light extracted
20 by the optical tunable filter;

generating information for designating the
control signal needed to enable the optical tunable filter
to extract signal light with a predetermined wavelength,
based on both a detected result of the signal light and
25 a detected result of the reference signal light; and

generating the control signal according to the designation information.

27. A method for controlling an optical tunable filter,
5 comprising:

detecting signal light with a specific wavelength
of all segments of signal light extracted by the optical
tunable filter, whose wavelength transmission
characteristic varies depending on a control signal,
10 transmitting and extracting signal light with a specific
wavelength from signal light multiplexed by a
wavelength-division multiplexing (WDM) method;

generating information for designating the
control signal needed to enable the optical tunable filter
15 to extract signal light with a predetermined wavelength,
based on both the detected result and information
indicating a current operating state of the multiplexed
signal light; and

generating the control signal according to the
20 designation information.

28. An optical communication system, comprising:

an optical tunable filter, whose wavelength
transmission characteristic varies depending on a
25 control signal, transmitting and extracting signal light

with a specific wavelength from signal light multiplexed
by a wavelength-division multiplexing (WDM) method;

detection means for detecting signal light
extracted by the optical tunable filter ; and

5 control signal generating means for generating the
control signal needed to enable the optical tunable filter
to extract signal light with a predetermined wavelength
by the detection means, based on a detected result
obtained by shifting a wavelength transmission
10 characteristic of the optical tunable filter in a
wavelength band including all segments of the multiplexed
signal light.

29. An optical communication system, comprising:

15 an optical tunable filter, whose wavelength
transmission characteristic varies depending on a
control signal, transmitting and extracting signal light
with a specific wavelength from signal light multiplexed
by a wavelength-division multiplexing (WDM) method;

20 detection means for detecting signal light
extracted by the optical tunable filter;

operation means for operating to generate
information for designating the control signal needed
to enable the optical tunable filter to extract signal
25 light with a designated wavelength, based on a detected

result of two segments of signal light at each edge of the wavelength band obtained by the shifting of the detection means when shifting a wavelength transmission characteristic of the optical tunable filter from outside
5 a wavelength band including all segments of the multiplexed signal light; and

control signal generating means for generating the control signal according to the designation information.

- 10 30. An optical communication system, comprising:
an optical tunable filter, whose wavelength transmission characteristic varies depending on a control signal, transmitting and extracting signal light with a specific wavelength from signal light multiplexed
15 by a wavelength-division multiplexing (WDM) method;
detection means for detecting signal light extracted by the optical tunable filter;
optical wavelength detecting means for detecting signal light with a specific wavelength of all segments
20 of signal light extracted by the optical tunable filter;
operation means for operating to generate information for designating the control signal needed to enable the optical tunable filter to extract signal light with a designated wavelength, based on both a
25 detected result of the detection means and the optical

wavelength detecting means and information indicating a current operating situation of the multiplexed signal light; and

control signal generating means for generating the
5 control signal according to the designation information.

31. An optical communication system, comprising:

an optical tunable filter, whose wavelength transmission characteristic varies depending on a
10 control signal, transmitting and extracting signal light with a specific wavelength from signal light multiplexed by a wavelength-division multiplexing (WDM) method;

detection means for detecting signal light extracted by the optical tunable filter;

15 reference signal light detecting means for detecting reference signal light that is known to be always included in signal light inputted to the optical tunable filter of all segments of signal light extracted by the optical tunable filter;

20 operation means for operating to generate information for designating the control signal needed to enable the optical tunable filter to extract signal light with a predetermined wavelength, based on both a detected result of the detection means and a detected
25 result of the reference signal light detecting means;

and

control signal generating means for generating the control signal according to the designation information.

5 32. An optical communication system, comprising:

an optical tunable filter, whose wavelength transmission characteristic varies depending on a control signal, transmitting and extracting signal light with a specific wavelength from signal light multiplexed

10 by a wavelength-division multiplexing (WDM) method;

optical wavelength detecting means for detecting signal light with a specific wavelength of all segments of signal light extracted by the optical tunable filter;

operation means for operating to generate
15 information for designating the control signal needed to enable the optical tunable filter to extract signal light with a predetermined wavelength, based on both a detected result of the optical detection means and information indicating a current operating state of the
20 multiplexed signal light; and

control signal generating means for generating the control signal according to the designation information.